

HAIR DRYER WITH INFRARED SOURCE

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to hairdryers. More particularly, the present invention relates to a hand-held, electric hairdryer with an infrared source.

2. Description of the Related Art

10 It is well known in the art to provide hairdryers with one or more primary heaters for heating air as it is pumped through a body structure for influencing the direction of the fluid air. These conventional hairdryers often employ fan-forced convection heating systems intended to heat air and then hair by convection.
15 These heating systems require large surface areas to effectively transfer heat to the fluid air. The temperatures associated with these conventional heating systems are generally kept low enough to avoid coil glow, which generally indicates poor heat transfer in localized areas and which can result in premature coil
20 failure. A typical hairdryer has sufficient energy transferred with the readily available surface area to keep wire temperatures at black heats, approximately 800 degrees C, and to still heat the air column to about 100 degrees C, the maximum temperature allowed by Underwriters Laboratories Inc. and similar regulating

agencies.

Other known hairdryers have featured protected wire structures or sources such as quartz tube heaters or halogen incandescent lamps, which employ higher temperature metals, such as tungsten, and vacuum or halogen gases to limit oxidation and breakdown of the heater wires at the higher temperatures. With these systems, the heat sources are often hot enough, approximately 1000 degrees C and higher, to emit visible light. The heater surface areas are relatively small, as the resistance wires are protected from exposure to air and the hotter wire is a more efficient radiator of energy. Energy available for heating and drying wet hair is transferred primarily as radiant heat, rather than by convection from heated air.

It is significant that infrared hairdryer systems have a component of convective energy transfer to their energy output and wire coil or convection heaters have a radiant component to their energy spectrum. Some known hairdryers have been provided with structures designed specifically to increase either one or the other convective or radiant components in the energy profile. For example, infrared dryers may have a fan mounted behind their heat lamps and wire-coil hairdryers may have relatively large masses of ceramic or metal masses nearby the coils in order to absorb heat from the resistance metal coils and then to reradiate that energy in wavelengths that more efficiently heat water. All these known systems, however, have relatively fixed profiles of energy emission. Overall power levels may be variable, but the

proportions of convective to radiant energy transfer remains fixed by the design of the system.

SUMMARY OF THE INVENTION

5 It is an object of the present invention to provide an improved hairdryer.

It is another object of the present invention to provide an improved hairdryer that more efficiently dries hair.

10 It is yet another object of the present invention to provide an improved hairdryer with both a primary and secondary heating source that may operate separately or individually and/or together or simultaneously.

15 It is still another object of the present invention to provide an improved hairdryer that allows an operator to selectively apply radiant energy and/or heated fluid air to one or more strands of hair as desired via a control interface.

20 It is yet still another object of the present invention to provide an improved hairdryer that safely allows, via self regulation, radiant energy to be selectively switched on and/or off and thereby added and/or removed from a fluid air.

It is a further object of the present invention to provide an improved hairdryer that allows a radiant energy component to be selectively provided to a fluid air generated by a convective

heating system.

It is still a further object of the present invention to provide an improved hairdryer with one or more infrared sources positioned along a centerline of a fluid air stream.

5 It is yet a further object of the present invention to provide an improved hairdryer having one or more variable and/or adjustable infrared sources.

These and other objects and advantages of the present invention are achieved by an improved hairdryer in accordance
10 with the present invention having a body with a handle portion and a head portion. The handle portion is preferably ergonomically shaped and preferably has a control interface. The head portion has an inlet end defining an air inlet and an outlet end defining an air outlet. The head portion also has a blower
15 for drawing air into the inlet, direct the fluid air through the head portion, and force the fluid air out the outlet.
Furthermore, the head portion also has one or more primary heaters for heating the fluid air as it passes through the head portion and one or more secondary heaters for selectively
20 providing radiant energy to the fluid air as it exits the head portion.

BRIEF DESCRIPTION OF THE DRAWINGS

Other and further objects, advantages and features of the

present invention will be understood by reference to the following specification in conjunction with the accompanying drawings, in which like reference characters denote like elements of structure.

5 Fig. 1 is a side, partial section, view of a hairdryer in accordance with an illustrative embodiment of the present invention;

 Fig. 2 is a side sectional view of a radiant energy source or secondary heating source in accordance with an illustrative
10 embodiment of the present invention;

 Fig. 3 is an exploded section view of the radiant energy source or secondary heating source of Fig. 2;

 Fig. 4 is an exploded perspective view of the radiant energy source or secondary heating source of Fig. 2 in accordance with
15 an illustrative embodiment of the present invention; and

 Fig. 5 is an exploded perspective view of the radiant energy source or secondary heating source of Fig. 2 in accordance with another illustrative embodiment of the present invention.

20 DETAILED DESCRIPTION OF THE INVENTION

 Referring to the drawings and in particular to Fig. 1, there is shown a hairdryer in accordance with a preferred embodiment of the present invention generally represented by reference numeral

1. The hairdryer 1 has a body 10 with at least two portions, a handle portion 20 and a head portion 30. The handle portion 20 is preferably ergonomically shaped for comfortable handling and may preferably have a control interface 22. The head portion 30 preferably has at least a first end 32 with an air ingress 33 and a second end 34 with an air egress 35. The head portion 30 is preferably suitable to accommodate a blower 36 for generating an airflow. The head portion 30 may preferably also accommodate one or more primary heating sources or primary heaters 40 for providing heat to the airflow and one or more secondary heating sources or secondary heaters 50 for selectively providing radiant energy to the airflow as desired.

As shown, blower 36 is preferably positioned between air ingress 33 and at least one primary heater 40 so that blower 36 may preferably operate to draw ambient air into head portion 30 thereby generating an airflow that may be initially heated as it passes at least one primary heater 40. Also as shown, at least one secondary heater 50 is preferably positioned between at least one primary heater 40 and air egress 35 so that the airflow may selectively be provided with radiant energy as desired before, after, and/or as the airflow exits head portion 30 via air egress 35. Further, in one aspect of the present invention, either or both air ingress 33 and air egress 35 may be provided with a grill structure 37 and 38, respectively, made of stamped metal, for example, for limit access to the various inner components of head portion 30.

Blower 36, one or more primary heaters 40, and/or one or more secondary heaters 50 are each preferably operatively connected to control interface 22, which may have any of a variety of controls for allowing the operator to select a variety of airflow and/or temperature settings. For example, control interface 22 may have, among other controls, a blower control 24, a primary heater control 26, and a secondary heater control 28. Preferably, blower control 24 allows the operator to selectively activate/deactivate blower 36 and/or otherwise control the intensity of the airflow exiting egress 35. The primary heater control 26 preferably allows the operator to selectively activate/deactivate one or more primary heaters 40 and/or otherwise control the heat or temperature provided thereby. Likewise, secondary heater control 28 preferably allows the operator to selectively activate/deactivate one or more secondary heaters 50 and/or otherwise operatively control the radiated energy provided thereby. It is noted that controls 24, 26, 28 need not separately control the various features of hairdryer 1, but rather any one or more controls may operate to control any two or more operating functions associated with hairdryer 1.

Blower 36, one or more primary heaters 40, and/or one or more secondary heaters 50 are also preferably operatively connected to a power source (not shown) via a power cord 29. The geometry, components, circuitry and connecting wires associated with blower 36, one or more primary heaters 40, and/or one or more secondary heaters 50, and any other component of hairdryer 1, as

appropriate, may preferably be similar to that which is known in the art. For example, in one aspect of the present invention, blower 36 may be a fan and motor assembly (not shown) with the fan configured so that when driven by the motor, via a rotary shaft, air is drawn into head portion 30. Also, as best shown in Fig. 1, primary heaters 40 may be a conventional convention heater with one or more coil heaters 42 wound on one or more crossed mica cards 44 mounted in head portion 30 of hairdryer 1.

Referring now to Figs. 2 and 3, in a preferred embodiment of the present invention one or more secondary heaters 50 may preferably be of an infrared (IR) nature and may preferably utilize a heater element 52, such as, for example, a PTC ceramic heater preferably having a doped ceramic with the property of variable electrical resistance depending on the ceramic temperature. Heater element 52 preferably has a positive temperature coefficient so that resistance increases with increased temperature. Heater element 52 preferably stabilizes around an average power input and/or temperature and may, therefore, be self-regulating. In addition, in one aspect of the present invention, heater element 52 preferably does not require additional temperature monitoring or control. It is noted, however, that this need not be the case. It may be possible in alternative embodiments of the present invention to use various other resistance-type heaters in combination with an electronic temperature monitor, such as a thermistor bead, for example. Further, any of a variety of different electronic control

circuits that offer additional features/benefits (e.g., variable and/or adjustable airflows, temperatures, and/or radiation components) may be used to accomplish the preferred power and/or temperature regulation or monitoring associated with the various
5 embodiments of the present invention.

As shown, in a preferred aspect of the present invention, heater element 52 of one or more secondary heaters 50 may preferably be positioned proximate to one or more, and preferably
10 at least two, electrodes 54 so that heater element 52 and electrodes 54 are preferably at least substantially in conductive contact. Preferably, each electrode 54 has one or more lead wires 56 that are preferably either directly or indirectly electrically connected to the power source and/or one or more
15 controls 24, 26, 28 of control interface 22.

In turn, heater element 52 and electrodes 54 may preferably be positioned in an insulator or insulating member 58 in a tight or secure manner so that insulating member 58 at least
20 substantially surrounds the heater/electrode assembly. It is noted that insulating member 58 may be formed of any suitable material known in the art. Insulating member 58 may then preferably be positioned in a conductive tube 60 having at least suitable thermally conductive and/or radiant properties, such as,
25 for example those properties provided by aluminum or the like. In a preferred aspect of the present invention, conductive tube

60 securely accommodates or tightly holds the heater/electrode/insulator assembly.

Conductive tube 60 preferably has two ends that may preferably be covered, closed and/or sealed. Each end is preferably sealed by preferably two conductive end caps, a first end cap 62 and a second end cap 64, each of which may also have at least thermally conductive and/or radiant properties. End caps 62, 64 may have any of a variety of shapes, sizes and/or configurations. For example, as reflected by first end cap 62, one or both end caps may be sized and shaped to fit over conductive tube 60 in a secure or tight manner. Alternatively, as reflected by second end cap 64, one or both end caps may be sized and shaped so as to fit in conductive tube 60 in a secure or tight manner. Thus, in this preferred aspect of the present invention, end caps 62, 64 preferably provide additional radiating and/or conductive surface area to that already provided by the outer surface of conductive tube 60.

In another aspect of the present invention, one or more secondary heaters 50 may preferably be operatively associated with one or more radiators 66. For example, as shown in Fig. 2, at least one radiator 66 may be press fit onto conductive tube 60 in at least a substantially secure or tight manner. Alternatively, the conductive tube 60 may be integrally formed as part of the radiator 66. Each radiator 66 may preferably be made of any of a variety of materials having thermally conductive

and/or radiant properties, such as, for example, aluminum, ceramic and/or stainless steel.

As best shown in Figs. 4 and 5, the one or more radiators 66
5 may preferably have one or more fins 68 preferably radially
arranged for optimal thermal radiation. Fins 68 are preferably
also fashioned from materials with appropriate thermal radiant
and conductive properties. Fins 68 may have any of a variety of
shapes, sizes and/or configurations as appropriate for
10 incorporation into a particular hair styling appliance.

Having identified and discussed some of the preferred
features of the present invention the present invention, in use,
preferably allows the operator to selectively provide radiant
15 energy via a switchable infrared source to one or more strands of
hair either separately or simultaneously with a heated airflow as
desired. This may be accomplished, for example, by positioning
the one or more secondary heaters 50 of the present invention at
egress 35 of head portion 30, and more preferably about or along
20 a centerline 70 thereof. For example, as reflected by Fig. 4,
the grill structure 38 of egress 35 may preferably securely
retain one or more secondary heaters 50 about or along centerline
70. Additionally, in various alternative embodiments of the
present invention, one or more secondary heaters 50 may be
25 positioned in head portion 30 at any point about or along
centerline 70 between primary heaters 40 and egress 35.

The present invention having been thus described with particular reference to the preferred forms thereof, it will be obvious that various changes and modifications may be made therein without departing from the spirit and scope of the present invention as defined herein. For example, as shown in Fig. 5, which is an alternative embodiment of the present invention, heater element 52 (e.g., a PTC heater or the like) may preferably be directly mounted to radiator 66 via a tubular opening 67, for example, in order to be centrally positioned with respect to the radiator.

It is believed that the many advantages of this invention and the manner in which it fulfills the stated objectives will be understood by those skilled in the art.